

ANNEX Q

DEBRIS REMOVAL

I. PURPOSE

The purpose of this plan is to assist in providing policies and guidance for the removal and disposition of debris caused by an emergency or disaster that affects Christian County.

II. SITUATION AND ASSUMPTIONS

A. Situation

1. Natural and man made disasters precipitate a variety of debris that would include, but not limited to such things as trees, sand, gravel, building/construction material, vehicles, personal property, etc.
2. The quantity and type of debris generated from any particular disaster will be a function of the location and kind of event experienced, as well as its magnitude, duration, and intensity.
3. The quantity and type of debris generated, its location, and the size of the area over which it is dispensed, will have a direct impact on the type of collection and disposal methods utilized to address the debris problem associated costs measured and how quickly the problem can be addressed.
4. In a major or catastrophic disaster, many state agencies and local governments will have difficulty in locating staff, equipment, and funds to devote to debris removal, in the short as well as long term.

B. Assumptions

1. A natural or man-made disaster that requires the removal of debris from public or private lands and water could occur in Christian County at any time.
2. The amount of debris resulting from an event or disaster could exceed the local or county's ability to dispose of it.
3. If the event or disaster requires, the Governor would declare a state of emergency that authorizes the use of state resources to assist in the removal and disposal of debris. In the event Federal resources

are required the Governor would request Federal Assistance in accordance with procedures established in the Federal Response Plan (FRP).

4. Private contractors will play a significant role in the debris removal, collection, reduction, and disposal.
5. The debris management program implements by state agencies and local governments will be based on the waste management approach of reduction, reuse, reclamation, resource recovery, incineration, and landfilling, respectively.

III. CONCEPT OF OPERATIONS

Initial Actions

- A. The chief executive or his designated representative will determine what resources will be required to support debris removal and disposal efforts.
- B. The amount of debris that is generated by an event can be estimated by several methods. One method is to accomplish a drive through “windshield” damage assessment and estimate the amount of debris visually with the drive through. Another method that can be used is an aerial assessment by flying over the area of damage. The damage area can be assessed either visually or using aerial photography. Once the area has been assessed the amount of debris may be estimated using a modeling methodology that was developed by the US Army Corps of Engineers, (USACE) Emergency Management staff using actual data from Hurricane Frederick, Hugo, and Andrews. This modeling technique is described in Appendix 3.
- C. After the amount of debris has been estimated the next critical issue will be the number of temporary sites and location of these sites for the collection and processing of debris. 1st priority: If possible, establish the site within the damaged area. 2nd Priority: Pre-determined local, county , or state property. Last Priority: Private property.
- D. Pre-Designated sites: Local government will develop Pre-Identified areas that may be used or temporary collection and processing sites. The information should include exact location, size, available routes, results of an environmental assessment, initial data samples, etc. Baseline data should include videotapes, photographs, documentation of physical features, and soil and water sampling.

- E. After a pre-designated site has been selected to be activated, there are many preparatory actions that need to be accomplished. A memorandum of understanding (MOU) would be required.
- F. Debris Removal
 - a. Natural disasters can generate large amounts of debris in a few hours or minutes. The debris may be equally heavy in both urban and rural areas depending on the magnitude of the --blow down, and associated structural damage such as homes, businesses, utilities, signs, etc. This section provides guidelines on debris removal issues including emergency road clearance, public right of ways, removal, mobile home park removal, private property removal and household hazardous waste (HHW) removed.
 - b. Debris removal, regardless of source, become a high priority following a disaster as it is a visible sign of action and helps to restore a sense of normalcy to a shocked and stunned population. Removal often represents the first visible step towards recovery. In developing a management strategy for a large scale debris removal operation, the operation should be divided into two phases. Phase I consists of the clearance of the debris that hinders immediate life saving actions being taken at the disaster site, and the clearance of that debris which poses and immediate threat to public health and safety. Phase II operations consist of the removal and disposal of that debris which is determined necessary to ensure the orderly recovery of the community and to eliminate less immediate threats to health and safety.
- G. Emergency Roadway debris removal (Phase I)

There is an immediate need to open emergency access routes into devastated areas following any type of major disaster. Local governments must identify routes within their jurisdiction that are essential to emergency operations. This information is essential for directing the effort of local assets and for identifying areas that state and federal assistance can target.

 - 1. Debris will include tree blow-down and broken limbs, yard trash such as outdoor furniture, trash cans etc., utility poles, power telephone, and cable TV lines, transformers and other electrical devices, building debris such as roofs, sheds, and signs, and personal property such as clothing, appliances, boats, cars, trucks, and trailers.

2. Roadway debris removal involves the opening up of major-ended streets by moving debris to the shoulders of the road. There is no attempt to physically remove or dispose of the debris, only to clean key access routes to:
 - a. Movement of emergency vehicles
 - b. Law enforcement
 - c. Resumption of critical services
3. Assessment of damage to key public facilities and utilities such as schools, hospitals, government buildings, municipal owned utilities.
4. The requirement of government services will be increased drastically following a major natural disaster. Therefore after emergency access has been provided to hospitals, police, and fire stations. The next priority is to open access to other critical community facilities such as municipal buildings, water treatment plants, wastewater treatment plants, power generation units, and airports.
5. Damaged utility systems structurally unstable buildings and other heavily damaged public facilities must be expeditiously repaired, deactivated, barricaded, or removed. Activities involving these facilities should be closely coordinated with their owner and or operators. Demolition of unsafe structures, which constitute a public health and safety threat in most situations, may be deferred if access to the area can be controlled.
6. Emergency Management and public works should be aware of local state and federal availability's to provide service for emergency road debris removal. Available resources should include:
 - a. LOCAL AND STATE GOVERNMENTS:
 - 1) Municipal workers and equipment
 - 2) local and state highway departments
 - 3) local private contractors hired by local and/or
 - 4) state governments
 - b. FEDERAL ASSISTANCE
 - 1) USDA Forest Service chain saw crews

- 2) Local US Army Corp of Engineers Workers Equipment
 - 3) Department of Defense
 - 4) Regional contractors hired by FEMA
7. Immediate debris removal actions should be supervised by local public works personnel using all available resources. Requests for additional assistance and resources should be made to the state EOC. Requests for Federal Assistance will be requested through the state coordinating officer (SCO) to the FEMA Federal Coordinating Officer (FCO) The request will be directed to the federal assistance debris coordinator (if on site and operational) or the USACE district authorized to contract services for FEMA.
8. Special crews equipped with chain saws may be required to cut up downed trees. This activity is hazardous and common sense safety considerations are necessary to reduce the chance of injury and possible loss of life. When live electric lines are involved, work crews should coordinate with local utility companies to have power links de-energized for safety reason.
9. Front end loaders and dozers should be equipped with cabs. Driveway cutouts, fire hydrants, valves, and storm-water inlets should be left unobstructed. All personnel should wear protective gear such as hard hats, gloves, goggles, and safety shoes.
10. The U.S.D. A. Forest Service and other state and federal land management agencies are equipped for fast responses to forest fires.
11. Assessment of the amounts and types of debris to be removed from key routes is very difficult. This drawback slows the development of the right mix of equipment and manpower, especially when contracting for additional resources. Therefore, the equipment rental contract is recommended for this type of debris removal. It will allow the flexibility to respond to local hot spots.

H. Public Right-Of-Way- Debris Removal (Phase II)

1. Debris is simply pushed to the shoulders of the roadway during the emergency opening (phase-1) of key routes. There is little time or concern for sorting debris at that time. The objective is to provide for the safe movement of emergency and support vehicles into and out of the disaster area.

2. As removal operations progress the initial road side piles of debris become the dumping location for additional yard waste and other storm generated debris such as construction material, personal property, trash, white goods (refrigerators, washers, dryers, hot water heaters, etc.), roofing and even household, commercial, and agricultural chemicals.
3. Expedient removal of debris from in front of residents' homes should become a priority since it is a positive sign that restoration actions are underway and may help counteract depression and helplessness of the affected residents. The removal operations will also assist in expediting the replacement of key utilities located along public rights-of-way.
4. The emergency manager and/or public works will be faced with the monumental tasks of coordinating debris. Removal that represents a significant health and safety hazard to the community, should be addressed first. There will be requests from all sectors of the community to remove the debris so that residents can start putting their lives and property in order.
5. Local and State government will transition from opening roadways to clearing right-of-ways. Other communities will offer workers to assist, as well as locally hired contractors who normally have limited resources. For large scale disasters, direct federal assistance, if required, will be provided by FEMA, USACE, DOD and large regional contractors with resources, experience, short mobilization times, and an understanding of federal contracting procedures.
6. The emergency management and public works will be required to provide accurate information surrounding the magnitude of the debris removal mission. Providing information to FEMA Region 7 headquarters and the State Emergency Management Agency may require an independent means to access debris removal progress. This void can be filled using local or state personnel to create independent field inspection teams. The teams become the eyes and ears for the debris staff.
7. Local government should be prepared to take the following actions:
 - a. coordinate through local agencies to establish a contracted work force capable of expeditious removal of the debris

- b. Develop an independent team using the local and state personnel to monitor the removal activities. This team becomes the debris managers “eyes and ears” in the field.
- c. Options debris removal and disposal actions are reviewed and approved by the local debris manager.
- d. Ensure that a representative of local government attends all briefings to resolve any coordination problems between state and federal debris removal efforts and local debris removal and disposal efforts.
- e. Coordinate with local and state law enforcement authorities to ensure that traffic control measures expedite debris removal activities.
- f. Establish a information management plan involving the EMA PIO and other agency PIOs. Emphasis should be placed on actions that the public can perform to expedite the cleanup process, such as separating burn-able, and non-burn-able debris; segregating household hazardous waste; placing debris at the curbside; keeping debris piles away from fire hydrants, valves, etc.; reporting locations of illegal dump sites or incidents of illegal dumping; and segregating recyclable materials.
- g. The public should be kept informed of debris pick-up schedules, disposal methods, and ongoing actions to comply with state and federal environmental protection agency (EPA) environmental regulations, disposal procedures for self-help and independent contractors, and restrictions and penalties for creating illegal dumps.
- h. Agency PIOs should be prepared to respond to questions pertaining to debris removal from the press and local residents. The following questions are likely to be asked:
 - 1) What is the pick-up system?
 - 2) When will the contractor be in the area?
 - 3) Who are the contractors and how can I contact them?
 - 4) Should I separate the different debris materials and how?
 - 5) How do I handle household hazardous waste?
 - 6) What if I cannot pay?
 - 7) What if I am elderly

I. Mobile Home Debris Removal

1. Tornadoes and high winds can cause almost complete destruction to mobile homes. This results in extensive amounts of mixed debris confined to relatively small areas. The mixed debris will include:
 - a. Trees blown-down, out buildings, screened porches, trailer frames, personal property, such as clothing, food, furniture, etc.
 - b. Appliances such as stoves, refrigerators, washers, dryers, etc.;
 - c. Household chemicals, commercial chemicals, propane and oxygen tanks, gasoline, oil lubricants, automobiles, trucks, bicycles, lawn mowers, and utility hook-ups.
2. A catastrophic disaster may require temporary housing that cannot be provided by local or state agencies. If direct federal assistance is requested and approved, FEMA may provide mobile homes on a temporary basis under the individual assistance (IA) program. FEMA's IA managers must obtain suitable locations to place FEMA mobile homes to provide temporary shelter expeditiously. Local mobile parks will be surveyed and arrangements made with parks owners for FEMA to clear the parks of debris in return for the park to lease pads for FEMA mobile homes. The local debris management coordinator and/or the public worker will need to closely coordinate with his/her counterpart in the FEMA IA office to assist in possible clean-up activities and to enforce condemnation procedures. The debris removal mission must strive to retain the existing undamaged utility hookups. Legal aspects as well as health and safety concerns will have an important impact on the debris removal activities.
3. Documentation Needed Prior To Contract Issuance
 - a. Local officials should:
 - 1) Obtain copies of the local ordinance authorizing condemnation of mobile home parks. Condemnation due to health issues is associated with prolonged exposure of trailer contents to the natural elements.

- 2) Provide a copy of the local government resolution with appropriate recitals required to support adoption/enactment of ordinances to condemn, demolish and remove mobile home park contents.
- 3) Provide access to all lands, basements, and right-of-way necessary for the accomplishments of the approved works.
- 4) Acquire documentation signed by the mobile home park owner that will hold and save the local, state or federal government free from damages due to the requested works, and shall indemnify the local, state or federal government against any claims arising from such works.
- 5) Provide documents allowing right-of-entry to the mobile home parks.
- 6) Provide notice to individual mobile home owners to remove items of personal property in accordance with local ordinances.
- 7) Provide the names of mobile home parks to include the names of mobile home parks owners, complete addresses and legal descriptions of the property, and limits, if any debris clearance to occur within the parks. Additional materials should include plats of the mobile home parks and any information about existing utilities. If the system is available, the EIS should be utilized to identify these mobile home parks.
- 8) Ensure that the mobile homes are unoccupied.
- 9) Ensure that the property is posted in accordance with local regulations and that mobile home owners have removed their personal property.
- 10) Ensure that any agreement made with the mobile home park owner is in writing to avoid subsequent disputes.
- 11) Obtain photographic documentation of trailer sites prior to commencement of work.

b. Utilities Local Officials Should

- 1) Ensure that utilities are installed according to local code.
- 2) Ensure that trailer tie down straps do not conflict with utility placement.
- 3) Be responsible for turning off utility services such as water, sewer, electrical, natural gas.

- 4) Have septic tank location flagged prior to debris removal and special care given to protect them during debris removal operations.
- 5) Evaluate existing utilities as to the feasibility of using them. Consideration should also be given to whether using heavy equipment would cause further damage to existing utilities.
- 6) Provide standards for capping of all utilities.

c. Contracts

- 1) Provide that all private automobiles be stored in a specific location within the parks to be retrieved later by the private owner.
- 2) Provide salvage rights to the contractor for materials remaining on site at the time of debris removal.
- 3) Require flagging of existing utilities prior to debris removal. Rubber tire vehicles and backhoe with grapple attachments should be used to protect existing utilities.
- 4) Require the contractor to phase debris removal operation to allow utility repair/replacement to begin immediately after an area has been cleared.
- 5) Provide a signed letter to the contractor FEMA identifying the park and stating that all notices have been issued and the park is released for debris removal.

d. Inspection Prior To Contract Issuance: Local officials should:

- 1) Should determine the extent of repairs required to use existing utilities or if full replacement of utilities will be required. These actions require close coordination with IA officials responsible for the temporary operations.
- 2) Ensure that the mobile home park will be vacated prior to removing any debris from the site.
- 3) Describe clearly and completely the extent of debris removal required within the mobile home park. Specify any structures other than mobile homes that are to be removed. This information will be utilized in developing the contract scope of work.
- 4) Locate and estimate any household hazardous waste within the park and ensure that appropriate procedures are established for separation and removal of such materials prior to debris removal. HHW contractors under contract with the local government should be utilized for this task via FEMA's Damage Survey Report (DSR) Process or the USACE could award a separate contract for this purpose HHW items typically found on site include propane tanks, paint cans, paint thinners, pesticides, refrigerators, freezers, etc.
- 5) Conduct initial inspections of the mobile home park. This should be done in conjunction with representatives from public health office, building and zoning office, real estate offices, USACE, and FEMA.
- 6) Notify the mobile home park owners of the pending inspections.
- 7) Ensure that the "notice to proceed" contract scope of work reflects findings of the field inspection.

4. Private Property Debris Removal

- a. Major natural disaster may create health and safety concerns with respect to severely damaged, remaining dangerous structures should be the responsibility of the owner or local government to demolish, to protect the health and safety of adjacent residents. However, experience has shown that unsafe structures will remain due to lack of insurance, absentee landlords, or understaffed and under equipped local governments.

Consequently, demolition of these structures may become the responsibility of public works dept.

- b. This issuer will require the complete cooperation of numerous local and state government officials and may require resources from any or all of the following: Real estate offices, law or code enforcement agencies, state historic preservation office, qualified contractors to remove household hazardous waste, asbestos, and lead based paint, and field teams to photograph the sites before and after demolition.
- c. Demolition of private property will present significant coordination problems. Therefore, a checklist has been developed to identify key tasks that local officials must address before the structure is approved for demolition. To expedite the overall effort, many of the tasks can be conducted concurrently.
- d. Communities in disaster-prone areas should have copies of the checklist and sample of required ordinances as part of the community's emergency management plan. The ordinances should be activated when a "state of emergency" is implemented eliminating any unnecessary waiting period. All of these pre-planning actions should be accomplished prior to a disaster.
- e. The most significant building demolition problem will be that local governments do not have proper ordinances in effect to handle emergency condemnation procedures. Moreover, structures will be misidentified or have people or belonging in them when the demolition crews arrive. Buildings may be occupied by drug users or homeless people who will necessitate removal by local law enforcement's close coordination is essential and it is recommended that at least one FEMA staff person be on site to work directly with the local government staff to ensure that all required legal actions are taken.

J. Household Hazardous Wastes (HHW) Removal

- 1. HHW may be generated as a result of a major natural disaster. HHW may consist of common household chemicals, propane tanks, oxygen bottles, batteries, and industrial and agricultural chemicals. These items will be mixed into the debris stream and

will require close attention throughout the debris removal and disposal process.

2. Pre-Disaster

The debris management coordinator should be aware of the problems that household hazardous waste will have on the overall debris removal and disposal mission consider HHW Response teams to be assigned and respond ahead of any removal efforts. Consider preparing draft emergency contracts with generic scopes of work. Coordinate with regulatory agencies concerning possible regulatory waivers, and other emergency response requirements.

3. Removal Operations

Where possible, separate hazardous materials from other debris before removal. Arrange for salvageable hazardous materials to be collected and segregated based on their intended use. Removal of hazardous waste should be accomplished by properly trained personnel or emergency response HHW contractors. Coordinate with regulatory agencies to ensure cleanup actions meet local, state, and federal regulations.

4. Building Demolition

Complete HHW identification and segregation before building demolition begins, HHW debris should be removed by qualified contractors. Uncontaminated debris can be removed by regular demolition contractors.

5. Disposal Sites

A separate staging area for HHW materials contaminated soils and contaminated debris should be established at each site. The staging area should be lined with an impermeable material and to prevent contamination of the ground water, and surrounding area. Materials should be removed and disposed of using qualified HHW personnel contractors in accordance with local, state and federal regulations.

K. Debris Collection And Reduction Sites

1. Once the debris is removed from the damaged area, it will be taken to temporary collection and reduction sites. Removal and disposal actions will be handled at the lowest level possible based on the magnitude of the event. It follows the normal chain of responsibility, i.e. local level, county level, state level and when resources are exceeded at each level of responsibility, and others. Federal assistance may be requested according to established procedures. Due to the limited debris removal and reduction resources, the establishment and operation of these temporary sites are generally accomplished by contracts.
2. Emphasis is placed on local government responsibilities for developing debris disposal contracts under FEMA Damage Survey Report (DSR) procedures. Removal and reduction activities may be handled locally or assigned to the USACE by FEMA. Mission assignment may be used instead of DSR's when responding to a catastrophic natural disaster. This allows FEMA and the USACE more flexibility in responding to specific debris removal and disposal tasks.
3. Local/county and or/ state government may be responsible for developing and implementing these contracts for debris removal and disposal under most disaster conditions that are not catastrophic. The costs associated with preparing implementing and monitoring contracts are covered under FEMA DSR Procedures. The debris manager should review all debris disposal

contracts. There should be a formal means to monitor contractor performance in order to ensure that funds are being used wisely.

L. Site Preparation

Site preparation and operations are usually left up to the contractor but guidance can help avoid problems with the ultimate close-out.

1. Establish lined temporary storage areas for ash, HHW, fuels, and other materials that can contaminate soils and ground water. Set up plastic liners when possible under stationary equipment such as generators and mobile lighting plants. Include this as a requirement of the contract scope of work.
2. If the site is also an equipment staging area, monitor fueling and equipment repair to prevent and mitigate spills of petroleum products, hydraulic fluids, etc. Include clauses in contract scope of work to require immediate cleanup by the contractor.
3. Not In My Back Yard (NIMBY) Concerns.

Be aware of and mitigate things that will irritate the neighbors, such as smoke, proper construction and operation of burn pits. Don't overload air curtains, dust (employ water trucks), noise (construct perimeter), traffic (proper layout of ingress and egress procedures to help traffic flow).

M. Debris Reduction Methods

This section provides guidelines on debris volume reduction method including burning, grinding and chipping, and recycling. The debris management coordinator should have an understanding of each method. Ideally, all methods should comply with local ordinances and environmental regulations.

N. Volume Reduction By Burning

1. There are several burning methods available including uncontrolled open burning, controlled open burning, air curtain pit burning, and refractor lined pit burning. The debris management coordinator (DMC) should consider each burning method before selection and implementation as part of the overall volume reduction strategy.

2. Uncontrolled Open Burning

Controlled open burning is a cost-effective method for reducing clean woody tree debris in rural areas. This option must be terminated if mixed debris (treated lumber, pales, nails, bolts, tin, aluminum, sheeting, etc.) enters the waste flow. Clean woody tree debris presents little environmental damage and the resulting ash can be used as a soil additive by the local agricultural community. Missouri Department of Agriculture and University of Missouri extension center personnel should be consulted to determine if and how the resulting ash can be recycled as a soil additive.

3. Local officials, environmental groups, and local citizens should be thoroughly briefed on the type of burning method being used, how the systems work, environmental standards, health issues, and the risk associated with each type of burning. PIOs should take the initiative to keep the public informed. A proactive public information strategy to include press releases, media broadcasts, etc. should be included in any operation that envisions burning as a primary means of volume reduction.

4. Environmental controls are essential for all burning methods and should include:

- a. A setback of at least 1000 ft should be maintained between the debris piles and the burn area. Keep at least 1000 ft between the burn area and the nearest building. Contractors should use fencing and warning signs to keep the public away from the burn area.
- b. The fire should be extinguished approximately two hours before anticipated removal of the ash mound. The ash mound should be removed when it reaches two feet below the lip of the burn pit.
- c. The burn area should be placed in an above ground or below ground pit that is no wider than eight feet and between nine and 14 feet deep.
- d. The burn pits should be constructed with limestone and reinforced with earth anchors or wire mesh in order to support the weight of the loaders. There should be a one-foot impervious layer of clay or limestone on the bottom of the pit to seal the ash from the aquifer.

- e. The ends of the pits should be sealed with dirt or ash to a height of four feet.
- f. A twelve-inch dirt seal should be placed on the lip of the burn pit area to seal the blower nozzle. The nozzle should be three to six inches from the end of the pit.
- g. There should be a one-foot high, unburnable, warning stop along the edge of the pits' length to prevent the loader from damaging the burn pit.
- h. Hazardous or contaminated ignitable material should not be placed in the pit. This is to prevent contained explosions.
- i. The airflow should hit the wall of the pit about two feet below the top edge of the pit and the debris should not break the path of the airflow except during dumping.
- j. The pit should be no longer than the length of the blower system and the pit should be loaded uniformly along the length.

O. Dead Animal Incinerators

It is very probable that an event may require the removal of dead animals as part of the debris management process. Local government should check with the Missouri Dept. of Natural Resource for the proper disposal methods and permits.

P. Volume Reduction By Grinding & Chipping

- 1. Tornadoes, and ice storms may present the opportunity to employ large scale grinding and chipping operations as part of the overall debris volume reduction strategy.
- 2. Grinding and chipping woody debris is a viable reduction method. Although more expensive than burning, grinding and chipping is more environmentally friendly and the resulting product - mulch can be recycled. In some locations the mulch will be a desirable product due to shallow topsoil conditions. In other locations it may become a landfill product.
- 3. Grinding and chipping wood debris reduces the large amounts of tree blow-down. Chipping operations are suitable in urban areas where streets are narrow or in groves of trees where it is cheaper to reduce the wood vegetation to mulch than to move it to a central

grinding site and then returning it to the affected area. This reduces the cost associated with double handing.

4. The debris removal coordinator should work closely with local environmental and agricultural groups to determine if there is a market for mulch. Another source disposal of ground wood debris may be as an alternative fuel for industrial heating or for use in a co-generation plant.
5. There are numerous makes and models of grinders and chippers on the market. If the grinding operation is strictly for volume reduction, size is not important. However, mulch to be used for agricultural purposes must be of a certain size and be virtually free of paper, plastic, dirt, etc.
6. The following specifications should provide a mulch product that is suitable for agricultural purposes.
 - a. The average size of wood chips produced should not exceed four inches in length and one half inch in diameter. Production output should average 100 to 150 cubic yards per hour when debris is moderately contaminated and slow feeding operations, and 200-250 cubic yards per hour for relatively clean debris. Note, this is not machine capability; this is contractor output or performance capabilities.
 - b. Contaminants are all materials other than wood products and should be held to ten percent or less for the mulch to be acceptable. Plastics are a big problem and should be eliminated completely. To help eliminated contaminants, root rake loaders should be used to feed or crowd materials to the grapplers. Bucket-loaders tend to scoop up earth, which is a contaminant, and cause excessive wear on the grinder or chipper. Hard laborers' should remove contaminants prior to feeding the grinders. Shaker screens should be used when processing stumps with root balls or when large amounts of soil are present in the wood debris.
7. Chippers are ideal for use in residential areas orchards, or groves. The number of damaged and uprooted trees present significant problem if they are pushed to the right-of-ways for eventual pick-up and transport to staging and reduction sites. The costs associated with chipping are reasonable since the material does not need to be transported twice.

8. Grinders are ideal for use at debris staging and reduction sites due to their high volume reduction capacity. Locating the grinders is critical from a noise and safety point-of-view. Moreover, there is a need for a large area to hold wood debris and an area to hold the resulting much. Ingress and egress to the site is also an important consideration.

Q. Volume Reduction By Recycling

1. Recycling reduces mixed debris volume before it is hauled to a landfill. Recycling is attractive and strongly supported by the county since there may be an economic value to the recovered material if it can be sorted and sold. A portable materials recovery facility (MRF) could be set up at the site. Metals, weed and soils are prime candidates for recycling. The major drawback is the potential environmental impact of the recycling operation. In areas where there is a large usage of chemical agricultural fertilizer the recovered soil may be too contaminated for use on residential or existing agricultural land.
2. Tornadoes and earthquakes may present opportunities to contract out large scale recycling operations and to achieve an economic return from some of the prime contractors who exercise their initiative to segregate and recycle debris as it arrives at the staging and reduction sites. Recycling has significant drawbacks if contracts are not properly written and closely monitored.
3. Specialized contracts should be available to bid on disposal of debris by recycling if it is well sorted. Contracts and monitoring procedures should be developed to ensure that the recyclers comply with local, state, and federal environmental regulations.
4. Recycling should be considered early in the debris removal and disposal operation since it may present an opportunity to reduce the overall cost of the operation. The following materials are suitable for recycling.
 - a. METALS-Tornadoes and high winds may cause extensive damage to mobile homes, sun porches, and green houses. Most of the metals are non-ferrous and suitable for recycling. Trailer frames and other ferrous metals are also suitable for recycling. Metals can be separated using an electromagnet. Metals that have been processed for recycling can be sold to metal recycling firms.

- b. SOIL- Cleanup operations using large pieces of equipment pick up large amounts of soil. The soil is transported to the staging and reduction sites where it is combined with other organic materials that will decompose overtime. Large amounts of soil can be recovered if the material is put through some type of screen or shaker system. This procedure can produce significant amount of soil that can either be sold or recycled back into the agricultural community. This soil could also be used at landfills for cover, but is more expensive to transport and pay tipping fees at local landfills than to sort out the heavy dirt before moving the material. Monitoring and testing of the soil may be necessary to ensure that it is not contaminated with chemicals.
- c. WOOD- Wood debris can be either ground or chipped into mulch.
- d. CONSTRUCTION MATERIAL- Concrete block and other building materials can be ground and used for other purposes if there is a ready market. Construction materials could also be used at state approved landfills for cover.
- e. RESIDUE MATERIAL- Residue material that cannot be recycled such as cloth, rugs, and trash can be sent to a landfill for final disposal.

R. Site Close-Out Procedures

- 1. Each temporary debris staging and reduction site will eventually be emptied of all material and be restored to its previous condition and use. If the size of event required mission tasking from the army corp of engineers, then the mission tasking may include requirements to cleanup contractor-operated staging and reduction sites. Contractors would be required to remove and dispose of all mixed debris, construction and demolition (C&D) debris and debris residue to approved landfills. Quality Assurance (QA) inspectors should monitor all close-out and disposal activities to ensure that contractors complied with contract specifications. Additional measures will be necessary to meet local, state, and federal environmental requirement due to the nature of the staging and reduction operation.
- 2. The debris management coordinator must be assured by the contractor that all sites are properly remedied. There will be significant costs associated with this operation as well as close

scrutiny by the local press and environmental groups. Site remediation will go smoothly if baseline data collection and site operation procedures are followed.

3. The basic close-out steps are: remove all debris from the site; conduct an environmental audit/assessment, develop a remediation/restoration plan approved by the appropriate environmental agency; execute the plan; get acceptance from the land owner; and terminate lease payments if applicable. The key to timely close-out of the mission is the efficient scheduling of the above activities for multiple sites. Therefore, critical path scheduling of all the activities as far in as possible will minimize down time between steps.

S. Environmental Restoration

Stockpiled debris will be a mix of wood vegetation, construction material, household items, and yard waste. HHW and medical wastes should be segregated and removed prior to stockpiling. Activities at the debris disposal sites will include some or a combination of the following activities: stockpiling, sorting, recycling, burning, grinding, and chipping. Burning is done in pits fed by an air curtain and generally only wood debris is burned; however, the efficiency of the burn and the quality of burn materials is highly variable. Contamination may occur from petroleum spills at staging and reduction sites or runoff from the debris piles, burn sites, and ash piles.

T. Site Remediation

1. During the debris removal process and after the material has been removed from each of the debris sites, environmental monitoring will be needed to close each of the sites. This is to ensure that no long term environmental monitoring will be needed to close each of the sites. This is to ensure that no long term environmental monitoring will be needed to close each of the sites. This is to ensure that no long-term environmental contamination is left on the site. The monitoring should be done on three different media: ash, soil, and -----.
 - a. The monitoring of the ash should consist of chemical testing to determine the suitability of the material for land filling.
 - b. Monitoring of the soils should be by portable methods to determine if any of the soils are contaminated by volatile hydrocarbons. This may be done by the contractors if it is determined that they dumped hazardous material, such as oil or diesel fuel spills on the site. This phase of the monitoring should be done after stockpile are removed from the site.
 - c. The monitoring of the ground-waste should be done on selected sites in order to determine the probable effects of rainfall leaching through either the ash areas or the stockpile areas.
2. A recommended format for a closure checklist has been developed. The closure checklist is shown on appendix. Consider the

following requirements to close-out a temporary staging and reduction sites.

- a. Coordinate with local and state officials responsible for construction, real estate, contracting, project management, and counsel regarding requirements and support for implementation of a site remediation plan.
- b. Establish a testing and monitoring program. The contractor should be responsible for environmental restoration of both public and leased sites. Contractors will also be required to remove all debris from sites for final disposal at landfills prior to closure.
- c. Reference appropriate and applicable environmental regulations.
 - 1) Prioritize site closures
 - 2) Schedule close-out activities
 - 3) Determine separate protocols for air, water, and soil testing.
 - 4) Develop cost estimates
 - 5) Develop decision criteria for certifying satisfactory closure based on limited baseline information.
 - 6) Develop administrative procedures and contractual arrangements for closure phase.
 - 7) Inform local and state environmental agencies regarding acceptability of program and establish requirements.
 - 8) Designate approving authority to review and evaluate contractor closure activities and progress.
 - 9) Retain staff during closure phase to develop site-specific remediation for sites, as needed, based on information obtained from the closure checklist.

IV. ORGANIZATION AND RESPONSIBILITIES

- A. State emergency management
 - 1. Perform as primary agency for information and planning on state and federal declared disasters.
 - 2. Perform as a core agency in the debris management task force.

- a. Send emergency management liaison to local EOC to assist in response and recovery operations for debris management.
- B. County and city government.
- C. Public works
 - 1. Coordinate debris management function
 - 2. Chairs debris management task force
 - 3. Responsible for debris cleanup on roads
 - 4. Bridges, right-of-ways and public property.
- D. Emergency management
 - 1. A member of the debris management tasks force.
 - 2. Work with public works for securing funds for debris management
 - 3. Assist with obtaining debris management resources.

V. ADMINISTRATION AND LOGISTICS

- A. All agencies will document personnel and material resources used to comply with this annex. Documentation will be used to support any federal assistance that may be requested or required.
- B. Requests for support and/or assistance will be upchanneled from the local level to the county level EOC and then to the state EOC. Requests for federal assistance will be made by the state EOC through established procedures as outlined in the federal response plan.
- C. All agencies will ensure 24 hour staffing capability during implementation of this annex if the emergency or disaster requires.-

VI. DEBRIS MODELING

- A. The modeling methodology described below was developed by the U.S. Army corps of Engineers Emergency management staff. The primary factor the model utilizes to estimate storm generated debris is the total number of households in a developed urban/suburban area. Other factors utilized are cubic yards of debris generated per household per storm category vegetative cover commercial density, and precipitation. The

household debris includes debris generated from damage to the house including content and surrounding shrubs/trees. Vegetative cover includes all trees/shrubbery and other debris located on public rights of way. Commercial density includes debris generated by damage to businesses and industrial facilities. The majority of commercial related debris will be removed by private contractors; however disposal/reduction space is still required. The amount of precipitation generated by a storm has a direct relationship on debris quantities.

B. Debris Estimating Formulas

1. The following information will assist you in determining the amount of debris from destroyed buildings, homes and debris piles.

- a. one-story building formula

$$\frac{L' \times W' \times H'}{27} = \text{CY} \times .33 = \text{CY}$$

- b. one story house formula

$$\frac{L' \times W' \times 8'}{27 \text{ percy}} = \text{cubic yards} \times 0.33 \text{ CY of Debris}$$

(The 0.33 factor accounts for the “air space” in the house)

- c. mobile homes formula

$$\frac{L' \times W' \times H'}{27} = \text{CY}$$

(The 0.33 factor is not applied to mobile home calculations due to their compact construction.)

- d. Debris Piles:

$$\frac{L' \times W' \times H'}{27} = \text{CY}$$

The following reminders may be of assistance when performing debris estimates.

2. Debris Estimating Table
Vegetative cover multiplier (yard waste)

Typical House	none	Light (1.1)	medium (1.3)
1000SF	98CY	107CY	127CY
147CY			
1200SF	118CY	129CY	153CY
177CY			
1400SF	137CY	150CY	178CY
205CY			
1600SF	155CY	170CY	201CY
232CY			
1800SF	175CY	192CY	228CY
263CY			
2000SF	195CY	215CY	254CY
293CY			
2200SF	215CY	237CY	280CY
323CY			
2400SF	235CY	259CY	306CY
353CY			
2600SF	255CY	280CY	332CY
383CY			

FORMULA: Square feet x 8 feet x .33 x multiplier = cubic yards
27

3. Mobile Home Debris Estimating

Singlewide=290 cubic yards
Doublewide=415 cubic yards

4. Measurements can be done in many ways. In most cases, measurements are made by volume. (Cubic Yards). However if

materials is being taken to a landfill, there may be access to a scale for weight measurements.

5. Record and document the process
6. Cubic yard : cubic yard. (CY) measurements are used to determine the unit price of debris. (Wood, mixed or ----) transported to a debris management site or permanent landfill.
 - a. All trucks being used to transport debris must be measured and the resulting quantity in cubic yards recorded on the site of the trucks and recorded on all load tickets.
 - b. Trucks with less than full capacities will be adjusted down by visual inspection by the field. Debris Monitor who will verify the quantity and type of debris contained in the bed of the truck from an inspection tow.
 - c. Ton Measurements: All trucks must have a certified tare weight (empty) established if payments are going to be made based on certified scale net weight receipts. Field Debris Monitors will be required to spot check trucks after dumping to see if they are still at their tare weight.
 - d. Gross weight- tare weight = net weight approximate conversions
 - 1) Construction and Demolition (C&D)
 - 2) CY of C&D debris to tons divide by 2
 - 3) Tons of C&D to CY -- multiply by 2
 - e. When developing cubic yards measurements, divide cubic feet by 27.